
DEPARTMENT OF THE ENVIRONMENT



AIR QUALITY SECTION

SAINT JOHN REGION AIR QUALITY DATA

1989 ANNUAL REPORT

D - 9201

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EXECUTIVE SUMMARY

This report summarizes ambient air quality data and monitoring activity in the greater Saint John area for 1989. Fourteen years of monitoring data are summarized in Part three. Rather significant improvement, with respect to locally produced pollutants, has occurred over the longer term. However, increases in concentrations of several pollutants were measured in 1988 and 1989.

Saint John is an industrial city where new industry and expanded production at existing facilities is able to cause short term air quality goals to be exceeded. The monitoring system continues to be modified and expanded to more efficiently assess these occurrences.

Odours remain a significant cause of complaints in Saint John. While an effective continuous odour monitor has not yet been developed, an improved hydrogen sulphide monitor operates in West Saint John. Three state of the art total reduced sulphur monitors were installed and operated by Irving Pulp and Paper Ltd. at various locations around their mill and are reported through the Department of the Environment's data acquisition system.

The Saint John Region lies downwind of the industrial areas located to the west and southwest and is impacted by the long range transport of various air pollutants.

In Part 4 of this report, five years of precipitation chemistry data are presented. Part 6 is a list of air quality guidelines and the abbreviations that are used in this report.



PART 1. INTRODUCTION

The Department of the Environment has operated an air quality monitoring network in Saint John since 1974. It includes a number of sampling locations linked by electronic telemetry to the Saint John Regional Office on Prince Street.

Continued emphasis on system reliability produced a data return of 90% for most parameters in 1989. Reliability has improved for the second consecutive year even though technical difficulties continued to plague the data collection and electronic telemetry system for the first half of the year.

New software with a better edit function was installed during the year which improved data handling capabilities. Back-up support from a manual system for the first part of the year was instrumental in keeping data return at acceptable levels.

Analysis of acidic deposition data for the Saint John Region indicated there was potential for environmental degradation, further studies are being undertaken. N.B. Power provided funding in 1988 to set up and operate a total of 12 wet deposition sites and 1989 represented the first full year of operation.

As a result of continued re-evaluation of the Air Quality Network, some sites were upgraded with the addition of new equipment. The Hi Volume Sampler at the Saint John Regional Centre was replaced with a PM-10 Sampler and PM-10 Samplers were added at Forest Hills and the Provincial Building.

As a result of an Ozone Enhancement Monitoring Program, a seasonal station was located at Norton and Environment Canada established a permanent station in Fundy National Park.

PART 2. PRESENTATION OF DATA

The following tables present frequency distributions of hourly average readings, monthly and annual means, and the number of monthly and annual observations.

The number of exceedances of the hourly provincial standard (or the acceptable federal guideline limit in the case of ozone) and the annual average concentrations are presented in summary tables for each station at the beginning of each of the following subsections. The annual average is an arithmetic mean; the geometric mean is used for particulate data.

The number of hourly samples taken should be noted before drawing any conclusions regarding monthly or annual averages. These averages are calculated based on all samples taken with no minimum number specified.

Section 2.01

CENTRAL BLISSVILLE

SUMMARY

Parameter	Seasonal Average	Number of One Hour Exceedances
Ozone	42.0 $\mu\text{g}/\text{m}^3$	0

Ozone (PPHM)

Frequency Distribution

Month	0-01	02-05	06-08	09-12	13+	No. of Samples	Monthly Average
May	196	292	0	0	0	488	1.8
June	249	469	0	0	0	718	1.9
July	165	567	9	0	0	741	2.4
August	183	545	13	0	0	741	2.4
September	265	263	9	0	0	537	1.8
October	239	491	11	0	0	741	2.1
TOTAL	1297	2627	42	0	0	3966	2.1

Section 2.02

CHAMPLAIN HEIGHTS

SUMMARY

PARAMETER	ANNUAL AVERAGE	NUMBER OF 1 HOUR EXCEEDANCES
Sulphur Dioxide	35.2 $\mu\text{g}/\text{m}^3$	1

SULPHUR DIOXIDE
(PPHM)

**** FREQUENCY DISTRIBUTION ****

Month	0-02	03-11	12-17	18-34	35+	NO.OF SAMPLES	MONTHLY AVERAGE
January	638	55	19	1	0	713	1.0
February	582	46	4	1	0	633	0.8
March	573	65	0	0	0	638	0.7
April	658	58	0	0	0	716	0.6
May	146	6	0	0	0	152	0.4
June	139	27	2	0	0	168	1.6
July	427	39	1	0	0	467	1.0
August	651	64	8	8	0	731	1.5
September	591	68	24	32	1	716	2.7
October	106	25	5	5	0	145	3.0
TOTAL	4511	453	67	47	1	5079	1.3

Section 2.03

FOREST HILLS

SUMMARY

PARAMETER	ANNUAL AVERAGE	NUMBER OF 1 HOUR EXCEEDANCES
Nitrogen Dioxide	8.4 $\mu\text{g}/\text{m}^3$	0
Ozone	54.0 $\mu\text{g}/\text{m}^3$	0
Sulphur Dioxide	34.4 $\mu\text{g}/\text{m}^3$	4
ANNUAL Suspended Lead	0.02 $\mu\text{g}/\text{m}^3$ *	N/A
ANNUAL Suspended Particulate	33.3 $\mu\text{g}/\text{m}^3$ *	0
ANNUAL Suspended Sulphate	5.43 $\mu\text{g}/\text{m}^3$ *	N/A
PM-10 ** Lead	0.01 $\mu\text{g}/\text{m}^3$ *	N/A
PM-10 ** Particulate	14.8 $\mu\text{g}/\text{m}^3$ *	N/A
PM-10 ** Sulphate	3.48 $\mu\text{g}/\text{m}^3$ *	N/A

* Annual Average expressed as a geometric mean

** Size Selective Inlet

NITROGEN DIOXIDE
(PPHM)

**** FREQUENCY DISTRIBUTION ****

MONTH	0-2	03-05	06-10	11-21	22+	NO. OF SAMPLES	MONTHLY AVERAGE
January	668	32	0	0	0	700	0.6
February	580	16	0	0	0	596	0.4
March	664	0	0	0	0	664	0.1
April	465	3	0	0	0	401	0.2
May	681	13	0	0	0	694	0.6
June	685	17	0	0	0	701	0.6
July	560	3	0	0	0	563	0.6
TOTAL	4303	84	0	0	0	4387	0.4

FOREST HILLS

OZONE
(PPHM)

**** FREQUENCY DISTRIBUTION ****

MONTH	0-01	02-05	06-08	09-12	13+	NO. OF SAMPLES	MONTHLY AVERAGE
January	99	601	0	0	0	700	2.6
February	108	487	0	0	0	595	2.6
March	72	572	20	0	0	664	3.7
April	34	674	2	0	0	710	3.4
May	52	628	13	0	0	693	3.2
June	79	614	8	0	0	701	2.7
July	88	559	39	0	0	686	3.1
August	270	456	17	0	0	743	2.0
September	270	286	7	0	0	563	1.7
October	157	569	17	0	0	743	2.6
November	84	405	0	0	0	489	2.4
December	203	540	0	0	0	743	1.8
ANNUAL	1516	6391	123	0	0	8030	2.7

SULPHUR DIOXIDE
(PPHM)

**** FREQUENCY DISTRIBUTION ****

MONTH	0-2	03-11	12-17	18-34	35+	NO. OF SAMPLES	MONTHLY AVERAGE
January	661	39	0	0	0	700	0.5
February	509	37	5	1	0	552	0.9
March	644	18	1	0	0	663	0.4
April	687	12	2	3	0	704	0.4
May	581	99	8	3	1	692	1.4
June	511	89	14	14	3	631	2.2
July	339	133	5	1	0	478	2.1
August	440	239	33	9	0	721	3.1
September	489	140	13	10	0	652	2.4
October	79	15	0	0	0	94	1.1
November	399	28	0	0	0	427	0.5
December	690	17	0	0	0	707	0.3
ANNUAL	6029	866	81	41	4	7021	1.3

FOREST HILLS

SUSPENDED PARTICULATE
($\mu\text{g}/\text{m}^3$)

**** FREQUENCY DISTRIBUTION ****

MONTH	0-30	31-60	61-90	91-120	120+	NO. OF SAMPLES	MONTHLY AVERAGE
January	2	0	1	0	0	3	30.1
February	2	2	0	0	0	4	27.0
March	0	3	1	0	0	4	45.5
April	4	1	0	0	0	5	24.0
May	2	3	0	0	0	5	40.7
June	1	2	1	1	0	5	46.8
July	0	4	1	0	0	5	54.1
August	3	0	0	0	0	3	24.3
September	1	2	1	0	0	4	43.9
October	2	3	1	0	0	6	35.0
November	5	0	0	0	0	5	23.6
December	3	0	0	0	0	3	15.2
ANNUAL	25	20	6	1	0	52	33.3

PM - 10 PARTICULATE
($\mu\text{g}/\text{m}^3$)

**** FREQUENCY DISTRIBUTION ****

MONTH	0-30	31-60	61-90	91-120	120+	NO. OF SAMPLES	MONTHLY AVERAGE
January	M	M	M	M	M	M	M
February	M	M	M	M	M	M	M
March	M	M	M	M	M	M	M
April	M	M	M	M	M	M	M
May	M	M	M	M	M	M	M
June	M	M	M	M	M	M	M
July	M	M	M	M	M	M	M
August	M	M	M	M	M	M	M
September	3	1	0	0	0	4	17.0
October	3	0	0	0	0	3	16.2
November	5	0	0	0	0	5	9.2
December	3	2	0	0	0	5	20.2
ANNUAL	14	3	0	0	0	17	14.8

Section 2.04

FUNDY PARK

SUMMARY

PARAMETER	ANNUAL AVERAGE	NUMBER OF 1 HOUR EXCEEDANCES
Ozone	58.0 $\mu\text{g}/\text{m}^3$	5

OZONE (PPHM)

**** FREQUENCY DISTRIBUTION ****

MONTH	0-01	02-05	06-08	09-12	13+	NO. OF SAMPLES	MONTHLY AVERAGE
June	54	450	6	3	0	513	2.6
July	6	689	47	2	0	744	3.4
August	6	388	22	0	0	416	3.4
September	47	654	14	0	0	715	2.6
October	18	720	6	0	0	744	2.8
November	5	194	0	0	0	199	2.4
TOTAL	136	3095	95	5	0	3331	2.9

Section 2.05

GRAND BAY

SUMMARY

PARAMETER	ANNUAL AVERAGES	NUMBER OF 1 HOUR EXCEEDANCES
Sulphur Dioxide	1.1 $\mu\text{g}/\text{m}^3$	0

SULPHUR DIOXIDE (PPHM)

**** FREQUENCY DISTRIBUTION ****

MONTH	0-2	03-11	12-17	8-34	35+	NO. OF SAMPLES	MONTHLY AVERAGE
January	742	1	0	0	0	743	0.0
February	631	0	0	0	0	631	0.0
March	508	2	0	0	0	510	0.1
April	662	2	0	0	0	664	0.1
May	705	5	1	0	0	711	0.1
June	688	5	0	0	0	693	0.1
July	709	2	0	0	0	711	0.0
August	700	1	0	0	0	701	0.0
September	112	0	0	0	0	112	0.0
October	629	0	0	0	0	629	0.0
November	686	4	0	0	0	690	0.1
December	711	1	0	0	0	712	0.0
ANNUAL	7483	23	1	0	0	7507	0.04

Section 2.06

NORTON

SUMMARY

PARAMETER	SEASONAL AVERAGE	NUMBER OF 1 HOUR EXCEEDANCES
Ozone	41.2 $\mu\text{g}/\text{m}^3$	0

OZONE (PPHM)

**** FREQUENCY DISTRIBUTION ****

MONTH	0-01	02-05	06-08	09-12	13+	NO. OF SAMPLES	MONTHLY AVERAGES
June	95	231	0	0	0	326	2.1
July	115	305	0	0	0	420	2.3
August	65	213	8	0	0	286	2.4
September	305	320	13	0	0	638	1.7
October	153	268	0	0	0	421	1.8
TOTAL	733	1337	21	0	0	2091	2.0

Section 2.07

POINT LEPREAU

SUMMARY

PARAMETER	SEASONAL AVERAGE	NUMBER OF 1 HOUR EXCEEDANCES
Ozone	44.0 $\mu\text{g}/\text{m}^3$	0

OZONE (PPHM)

**** FREQUENCY DISTRIBUTION ****

MONTH	0-01	02-05	06-08	09-12	13+	NO. OF SAMPLES	MONTHLY AVERAGES
May	138	208	0	0	0	346	1.7
June	200	489	29	0	0	718	2.4
July	112	608	22	0	0	742	2.9
August	412	314	0	0	0	726	1.4
TOTAL	862	1619	51	0	0	2532	2.2

Section 2.08

POLICE STATION (FREDERICTON)

SUMMARY

PARAMETER	ANNUAL AVERAGE	NUMBER OF 1 HOUR EXCEEDANCES
Total Suspended Lead	0.02 $\mu\text{g}/\text{m}^3$ *	N/A
Total Suspended Particulate	29.7 $\mu\text{g}/\text{m}^3$ *	0
Total Suspended Sulphate	2.88 $\mu\text{g}/\text{m}^3$ *	N/A

* Annual Average expressed as a Geometric Mean

SUSPENDED PARTICULATE
($\mu\text{g}/\text{m}^3$)

**** FREQUENCY DISTRIBUTION ***

MONTH	0-30	31-60	61-90	91-120	120+	NO. OF SAMPLES	MONTHLY AVERAGE
January	4	1	0	0	0	5	20.1
February	2	2	0	0	0	4	27.2
March	1	2	1	1	0	5	43.8
April	3	1	1	0	0	5	29.8
May	1	2	2	0	0	5	43.2
June	1	3	1	0	0	5	45.8
July	4	1	0	0	0	5	27.8
August	5	0	0	0	0	5	17.9
September	1	4	0	0	0	5	34.3
October	1	3	1	0	0	5	37.7
November	4	1	0	0	0	5	20.1
December	2	3	0	0	0	5	25.1
ANNUAL	29	23	6	1	0	59	29.7

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Section 2.09

POST OFFICE

PARAMETER	ANNUAL AVERAGES		NUMBER OF 1 HOUR EXCEEDANCES
Carbon Monoxide	491	$\mu\text{g}/\text{m}^3$	0
Nitrogen Dioxide	17.5	$\mu\text{g}/\text{m}^3$	0
Ozone	48.8	$\mu\text{g}/\text{m}^3$	3
Sulphur Dioxide	16.6	$\mu\text{g}/\text{m}^3$	0

CARBON MONOXIDE (PPM)

**** FREQUENCY DISTRIBUTION ****

MONTH	0-01	02-06	07-12	13-35	36+	NO. OF SAMPLES	MONTHLY AVERAGES
February	598	73	0	0	0	671	0.6
March	688	55	0	0	0	743	0.4
April	662	54	0	0	0	716	0.3
May	667	57	0	0	0	724	0.5
June	638	51	0	0	0	689	0.5
July	682	34	0	0	0	716	0.4
August	717	14	0	0	0	731	0.3
September	684	31	0	0	0	715	0.3
October	658	85	0	0	0	743	0.6
November	662	56	1	0	0	719	0.4
December	705	13	0	0	0	718	0.2
TOTAL	7361	523	1	0	0	7885	0.4

NITROGEN DIOXIDE (PPHM)

****FREQUENCY DISTRIBUTION ****

MONTH	0-02	03-05	06-10	11-21	22+	NO. OF SAMPLES	MONTHLY AVERAGE
January	738	3	0	0	0	741	0.2
April	380	40	1	0	0	421	1.0
May	523	82	1	0	0	606	1.3
June	600	86	3	0	0	689	1.3
July	650	67	0	0	0	717	1.1
August	679	52	0	0	0	731	1.0
September	380	36	0	0	0	416	1.2
November	36	2	0	0	0	38	0.8
December	128	0	0	0	0	128	0.4
TOTAL	4114	368	5	0	0	4487	1.0

POST OFFICE

OZONE (PPHM)

****FREQUENCY DISTRIBUTION ****

MONTH	0-01	02-05	06-08	09-12	13+	NO. OF SAMPLES	MONTHLY AVERAGE
January	200	530	9	3	0	742	2.3
February	168	501	2	0	0	671	2.3
March	126	604	12	0	0	742	2.9
April	104	598	2	0	0	704	3.0
May	76	460	26	0	0	562	3.1
June	133	315	4	0	0	452	2.1
July	61	206	8	0	0	275	2.5
August	161	542	30	0	0	733	2.6
September	251	444	14	0	0	709	2.1
October	248	483	12	0	0	743	2.1
November	210	508	1	0	0	719	2.1
December	157	561	0	0	0	718	2.2
ANNUAL	1895	5752	120	3	0	7770	2.4

SULPHUR DIOXIDE
(PPHM)

**** FREQUENCY DISTRIBUTION ****

MONTH	0-02	03-11	12-17	18-34	35+	NO. OF SAMPLES	MONTHLY AVERAGE
January	665	45	1	0	0	711	0.9
February	591	52	0	0	0	643	1.0
March	307	30	1	0	0	338	0.9
April	663	10	0	0	0	673	0.4
May	458	5	0	0	0	463	0.3
June	583	11	0	0	0	594	0.3
July	681	5	0	0	0	686	0.3
August	709	3	0	0	0	712	0.3
September	662	20	0	0	0	682	0.7
October	674	38	0	0	0	712	0.8
November	634	53	2	0	0	689	1.0
December	662	25	1	0	0	688	0.6
ANNUAL	7289	297	5	0	0	7591	0.6

Section 2.10

PROVINCIAL BUILDING

SUMMARY

PARAMETER	ANNUAL AVERAGE	NUMBER OF 1 HOUR EXCEEDANCES
Total Suspended Lead	0.02 $\mu\text{g}/\text{m}^3$ *	N/A
Total Suspended Particulate	29.4 $\mu\text{g}/\text{m}^3$ *	0
Total Suspended Sulphate	4.30 $\mu\text{g}/\text{m}^3$ *	N/A

* Annual Average expressed as a Geometric mean.

SUSPENDED PARTICULATE
($\mu\text{g}/\text{m}^3$)

****FREQUENCY DISTRIBUTION ****

MONTH	0-30	31-60	61-90	91-120	120+	NO. OF SAMPLES	MONTHLY AVERAGE
January	4	1	0	0	0	5	24.6
February	2	2	0	0	0	4	25.6
March	1	4	0	0	0	5	47.4
April	2	3	0	0	0	5	32.8
May	2	2	1	0	0	5	36.8
June	3	1	1	0	0	5	27.0
July	3	1	0	0	0	4	23.7
August	5	0	0	0	0	5	16.5
September	3	2	0	0	0	5	31.1
October	2	3	0	0	0	5	33.5
November	2	3	0	0	0	5	28.8
December	1	2	0	0	0	3	36.5
ANNUAL	30	24	2	0	0	56	29.4

Section 2.11

REGIONAL CENTRE

SUMMARY

PARAMETER	ANNUAL AVERAGE	NUMBER OF 1 HOUR EXCEEDANCES
Hydrogen Sulphide	4.4 $\mu\text{g}/\text{m}^3$	451
Sulphur Dioxide	13.0 $\mu\text{g}/\text{m}^3$	0
Total Suspended Lead	0.02 $\mu\text{g}/\text{m}^3$ *	N/A
Total Suspended Particulate	29.9 $\mu\text{g}/\text{m}^3$ *	1
Total Suspended Sulphate	5.02 $\mu\text{g}/\text{m}^3$ *	N/A
PM-10 ** Lead	0.02 $\mu\text{g}/\text{m}^3$ *	N/A
PM-10 ** Particulate	15.5 $\mu\text{g}/\text{m}^3$ *	N/A
PM-10 ** Sulphate	5.17 $\mu\text{g}/\text{m}^3$ *	N/A

*Annual Average expressed as a Geometric mean.

** Size Selective Inlet

HYDROGEN SULPHIDE
(PPHM)

**** FREQUENCY DISTRIBUTION ****

MONTH	001	02-05	06-10	11+	NO. OF SAMPLES		MONTHLY AVERAGE
January	476	182	83	8	0	749	0.5
February	365	237	69	0	0	671	0.6
March	473	179	80	5	1	738	0.6
April	607	28	29	9	1	674	0.2
May	517	166	22	6	3	714	0.4
June	360	292	38	0	0	690	0.5
July	498	179	34	4	0	715	0.4
August	613	79	18	2	1	713	0.2
September	624	54	9	2	0	689	0.1
October	680	32	0	0	0	712	0.0
November	560	105	24	1	0	690	0.2
December	630	80	2	0	0	712	0.1
ANNUAL	6403	1613	408	37	6	8467	0.3

REGIONAL CENTRE

SULPHUR DIOXIDE
(PPHM)

**** FREQUENCY DISTRIBUTION ****

MONTH	0-02	03-11	12-17	18-34	35+	NO. OF SAMPLES	MONTHLY AVERAGE
January	672	71	0	0	0	743	0.8
February	633	38	0	0	0	671	0.7
March	645	48	1	0	0	694	0.6
April	672	19	0	0	0	691	0.4
May	697	16	0	0	0	713	0.3
June	672	18	0	0	0	690	0.2
July	696	16	0	0	0	712	0.3
August	696	13	0	0	0	709	0.2
September	650	23	0	0	0	673	0.3
October	693	18	0	0	0	711	0.4
November	673	11	0	0	0	684	0.4
December	606	106	0	0	0	712	1.3
ANNUAL	8005	397	1	0	0	8403	0.5

SUSPENDED PARTICULATE
($\mu\text{g}/\text{m}^3$)

**** FREQUENCY DISTRIBUTION ****

MONTH	0-30	31-60	61-90	91-120	120+	NO. OF SAMPLES	MONTHLY AVERAGE
January	1	4	0	0	0	5	43.0
February	2	1	0	0	0	3	31.6
March	0	1	0	0	0	1	36.1
April	1	1	0	0	1	3	69.0
May	1	4	0	0	0	5	38.9
June	3	1	0	0	0	4	25.1
July	2	3	0	0	0	5	28.1
August	4	1	0	0	0	5	14.3
September	4	1	0	0	0	5	25.6
October	3	1	0	0	0	4	25.9
November	M	M	M	M	M	M	M
December	M	M	M	M	M	M	M
ANNUAL	21	18	0	0	1	40	29.9

REGIONAL CENTRE

PM-10 PARTICULATE
($\mu\text{g}/\text{m}^3$)

****FREQUENCY DISTRIBUTION ****

MONTH	0-30	31-60	61-90	91-120	120+	NO. OF SAMPLES	MONTHLY AVERAGE
January	M	M	M	M	M	M	M
February	M	M	M	M	M	M	M
March	M	M	M	M	M	M	M
April	M	M	M	M	M	M	M
May	M	M	M	M	M	M	M
June	M	M	M	M	M	M	M
July	M	M	M	M	M	M	M
August	M	M	M	M	M	M	M
September	M	M	M	M	M	M	M
October	2	0	0	0	0	2	14.6
November	5	0	0	0	0	5	11.0
December	4	1	0	0	0	5	22.4
ANNUAL	11	18	0	0	0	12	15.5

Section 2.12

WESTERN DISTRICT POLICE STATION

SUMMARY

PARAMETER	ANNUAL AVERAGE	NUMBER OF 1 HOUR EXCEEDANCES
Total Suspended Lead	0.02 $\mu\text{g}/\text{m}^3$ *	N/A
Total Suspended Particulate	27.4 $\mu\text{g}/\text{m}^3$ *	0
Total Suspended Sulphate	2.99 $\mu\text{g}/\text{m}^3$ *	N/A

* Annual Average expressed as a Geometric mean.

SUSPENDED PARTICULATE
($\mu\text{g}/\text{m}^3$)

****FREQUENCY DISTRIBUTION ****

MONTH	0-30	31-60	61-90	91-120	120+	NO OF SAMPLES	MONTHLY AVERAGE
January	2	2	1	0	0	5	35.0
February	2	3	0	0	0	5	27.9
March	3	2	0	0	0	5	31.2
April	5	0	0	0	0	5	19.8
May	2	2	0	0	0	4	31.3
June	2	2	1	0	0	5	36.8
July	1	4	0	0	0	5	32.0
August	3	1	0	0	0	4	24.2
September	3	2	0	0	0	5	27.4
October	4	2	0	0	0	6	30.6
November	5	0	0	0	0	5	19.6
December	4	1	0	0	0	5	19.6
ANNUAL	36	21	2	0	0	59	27.4

PART 3A ACTIVE STATIONS: CUMULATIVE RECORD OF ANNUAL CONCENTRATIONS

Section 3.01

SULPHUR DIOXIDE
($\mu\text{g}/\text{m}^3$)

YEAR	POST OFFICE	FOREST HILLS	CHAMPLAIN HEIGHTS	REGIONAL CENTRE	GRAND BAY
1976	38.8	27.5	-	-	-
1977	42.7	48.6	27.6	-	-
1978	19.0	40.1	35.7	-	-
1979	48.4	38.7	34.2	-	-
1980	34.0	54.0	42.0	-	-
1981	39.2	44.4	48.5	-	-
1982	17.4	47.7	27.4	-	-
1983	15.9	34.5	21.1	-	-
1984	18.6	29.2	10.6	-	-
1985	29.2	23.9	15.9	-	-
1986	20.4	22.7	25.7	-	-
1987	14.0	19.9	14.6	-	-
1988	15.9	31.3	23.1	15.9	0.7
1989	16.6	34.4	35.2	13.0	1.1

Section 3.02 TOTAL SUSPENDED PARTICULATE / SULPHATE
($\mu\text{g}/\text{m}^3$)

YEAR	W.D. POLICE STATION		PROVINCIAL BUILDING		FOREST HILLS		REGIONAL CENTRE	
	TSP	SO ₂	TSP	SO ₂	TSP	SO ₂	TSP	SO ₂
1976	36.8	-	49.4	-	51.0	-	-	-
1977	32.8	-	63.0	-	43.6	-	-	-
1978	38.2	2.3	56.8	5.7	53.2	-	-	-
1979	36.9	1.3	58.3	4.1	38.1	-	-	-
1980	38.0	2.3	68.8	6.2	43.3	-	-	-
1981	30.5	1.66	57.2	3.89	38.5	-	-	-
1982	33.6	2.39	58.7	4.95	43.3	-	-	-
1983	26.5	2.18	39.7	4.11	45.6	4.26	-	-
1984	24.1	2.54	33.1	4.43	33.7	3.20	-	-
1985	21.1	1.15	36.5	4.66	36.1	3.70	-	-
1986	20.9	2.19	38.4	4.25	35.3	3.23	-	-
1987	24.2	2.30	39.9	3.93	45.6	3.60	-	-
1988	42.2	2.73	47.9	4.18	49.6	4.49	57.6	6.20
1989	27.4	2.99	29.4	4.30	33.3	5.43	29.9	5.02

CUMULATIVE RECORD OF ANNUAL CONCENTRATIONS

YEAR	Section 3.03 Carbon Monoxide ($\mu\text{g}/\text{m}^3$)	Hydrogen Sulphide ($\mu\text{g}/\text{m}^3$)	Nitrogen Dioxide ($\mu\text{g}/\text{m}^3$)	
	POST OFFICE	REGIONAL CENTRE	POST OFFICE	FOREST HILLS
1976	-	-	-	-
1977	-	-	-	19.6
1978	-	-	-	13.5
1979	-	-	-	16.9
1980	811	-	5.7	13.5
1981	397	-	31.0	-
1982	695	-	28.5	38.6
1983	680	-	22.8	49.4
1984	1440	-	22.8	11.2
1985	600	-	22.8	20.9
1986	776	-	22.2	19.9
1987	768	-	36.7	19.6
1988	492	6.6	24.1	12.5
1989	491	4.4	17.5	8.4

Section 3.04

OZONE ($\mu\text{g}/\text{m}^3$)

YEAR	CENTRAL BLISSVILLE	FOREST HILLS	FUNDY PARK	POINT LEPREAU	POST OFFICE	NORTON
1976	-	-	-	-	-	-
1977	-	76.3	-	-	-	-
1978	-	63.3	-	-	-	-
1979	-	-	-	-	-	-
1980	-	52.5	-	-	4.7	-
1981	-	45.2	-	-	35.2	-
1982	-	43.3	-	-	44.5	-
1983	-	44.0	-	-	46.0	-
1984	-	78.0	-	-	44.0	-
1985	-	60.0	-	-	40.0	-
1986	-	57.5	-	36.0	41.8	-
1987	33.6	45.2	-	44.8	47.2	-
1988	44.2	58.6	-	79.4	48.0	-
1989	42.0	54.0	58.0	44.0	48.8	41.2

Section 3.05

TOTAL SUSPENDED LEAD
($\mu\text{g}/\text{m}^3$)
(Geometric Means)

YEAR	FOREST HILLS	PROVINCIAL BUILDING	POLICE STATION	FREDERICTON FIRE STATION	REGIONAL CENTRE
1974	-	-	0.44	-	-
1975	-	0.46	0.41	0.76	-
1976	0.25	0.31	0.18	0.55	-
1977	0.18	0.23	0.14	0.42	-
1978	0.17	0.20	0.12	0.34	-
1979	0.18	0.21	0.11	0.39	-
1980	0.26	0.19	0.10	0.34	-
1981	0.24	0.20	0.11	0.34	-
1982	0.21	0.17	0.11	0.29	-
1983	0.15	0.12	0.08	0.24	-
1984	0.11	0.11	0.09	0.17	-
1985	0.14	0.12	0.10	0.16	-
1986	0.10	0.11	0.08	0.13	-
1987	0.02	0.02	0.02	0.03	-
1988	0.01	0.01	0.02	0.02	0.02
1989	0.02	0.02	0.02	0.02	0.02

PART 3B INACTIVE STATIONS CUMULATIVE RECORD OF ANNUAL CONCENTRATIONS

Section 3.06

SULPHUR DIOXIDE
($\mu\text{g}/\text{m}^3$)

YEAR	POLICE STATION	MILLIDGVILLE	REDHEAD	DEMONT'S STREET	SILVER FALLS
1976	3.8	20.2	15.7	-	-
1977	4.4	29.6	21.4	56.0	-
1978	9.2	13.4	17.7	35.4	-
1979	7.7	17.4	13.3	33.1	-
1980	19.3	16.9	8.0	25.4	-
1981	15.9	15.0	13.2	-	-
1982	13.3	16.5	16.4	12.2	-
1983	10.6	13.3	8.0	10.6	18.6
1984	10.6	8.0	5.3	15.9	21.2
1985	-	-	-	-	-
1986	-	-	-	-	-
1987	-	-	-	-	-
1988	-	-	-	-	-

Section 3.07

TOTAL SUSPENDED PARTICULATE / SULPHATES
($\mu\text{g}/\text{m}^3$)

YEAR	MILLIDGEVILLE		REDHEAD	
	TSP	SO ₂	TSP	SO ₂
1976	55.8	-	28.1	-
1977	44.3	-	27.9	-
1978	54.9	-	30.6	4.1
1979	50.1	-	28.6	2.1
1980	54.8	-	35.8	2.9
1981	38.5	-	32.7	2.52
1982	41.3	-	29.9	2.74
1983	38.3	3.20	23.8	3.54
1984	32.8	3.47	19.3	3.19
1985	35.1	3.27	23.1	3.59
1986	34.0	2.75	-	-
1987	51.4	3.89	-	-
1988	-	-	-	-

Section 3.08

CARBON MONOXIDE
($\mu\text{g}/\text{m}^3$)HYDROGEN SULPHIDE
($\mu\text{g}/\text{m}^3$)

YEAR	FOREST HILLS	DEMONT'S STREET
1976	-	-
1977	1510	-
1978	720	6.6
1979	650	4.8
1980	746	9.1
1981	464	0.6
1982	495	2.3
1983	1200	4.2
1984	1080	2.8
1985	-	-
1986	-	3.5
1987	-	8.1
1988	-	-

Section 3.09

OZONE
($\mu\text{g}/\text{m}^3$)DUSTFALL
($\mu\text{g}/\text{m}^3$)

YEAR	POLICE STATION	ROAD	BROOKVILLE HILL	BISHOPS	PROVINCIAL HOSPITAL
1976	-	10.3	11.8	24.6	9.2
1977	-	4.5	8.2	11.2	9.1
1978	-	11.0	9.0	16.1	13.0
1979	-	5.2	8.9	13.9	8.2
1980	46.5	5.1	17.4	21.3	11.6
1981	-	7.1	13.9	15.3	14.1
1982	-	5.6	5.0	-	7.3
1983	48.0	-	-	-	-
1984	-	-	-	-	-
1985	-	-	-	-	-
1986	-	-	-	-	-
1987	-	-	-	-	-
1988	-	-	-	-	-

Section 3.10

SULPHATION RATE
(mg/so₄/100 cm²/day)

YEAR	PROVINCIAL HOSPITAL	MUSQUASH ROAD	PROVINCIAL BUILDING	RED HEAD	LUDGATE LAKE	ROCKWOOD PARK
1974	1.89	-	-	0.62	-	-
1975	2.46	-	-	1.22	-	-
1976	1.62	0.31	1.09	0.42	0.25	0.51
1977	1.45	0.26	1.43	0.45	0.26	0.50
1978	1.83	0.41	1.04	0.46	0.52	0.55
1979	3.91	0.37	1.39	0.79	0.45	0.59
1980	1.44	0.13	0.79	0.36	0.20	0.47
1981	1.48	0.22	0.90	0.36	0.24	0.51
1982	-	0.21	1.02	0.35	0.24	0.52
1983	1.36	-	0.75	0.33	-	-

&

YEAR	BLOOMSB. MOUNTAIN	SHADOW LAKE	CANAPORT	FOREST HILLS	DEMONT'S STREET	MILL'G VILLE
1976	0.31	0.15	-	-	-	0.62
1977	0.25	0.30	-	0.75	0.65	0.42
1978	0.46	0.16	-	1.21	0.81	0.78
1979	0.43	0.50	0.49	0.74	1.02	0.53
1980	0.17	0.20	0.27	0.55	0.49	0.43
1981	0.17	0.19	0.27	0.66	0.48	0.32
1982	0.25	0.29	0.32	0.74	0.55	0.39
1983	-	-	-	0.66	0.47	0.39

Section 3.11

TOTAL SUSPENDED LEAD
($\mu\text{g}/\text{m}^3$)
(Geometric Means)

YEAR	REDHEAD	MILLIDGEVILLE
1974	0.08	0.24
1975	0.11	0.33
1976	0.06	0.23
1977	0.04	0.12
1978	0.07	0.18
1979	0.04	0.19
1980	0.26	0.26
1981	0.05	0.21
1982	0.05	0.19
1983	0.03	0.11
1984	0.05	0.10
1985	0.10	0.12
1986	-	0.08
1987	-	0.03
1988	-	-



PART 4 ACIDIC PRECIPITATION DATA

4.01 General

The following tables present parameters measured in the Coleson Cove and Expanded New Brunswick Precipitation Monitoring Network. Data is tabulated on a calendar year basis. Values of pH are volume weighted means, precipitation is the annual total and sulphate and nitrate depositions are derived from total site precipitation and volume weighted concentrations.

Stations were established in late 1984 at Forest Hills, Musquash, Lonewater Farm and Darling's Island. The Forest Hills station was discontinued in early 1987 due to siting problems. New Stations were added in 1988 at Bonny River, Golden Grove, Lakewood Heights, Magaguadavic Lake, Pennfield, Second Falls, Shannon, South Oromocto Lake, Tracy and Wirral Station. In addition, tables presenting the frequency distribution of daily total suspended particulate for Musquash, Lonewater and Darling's Island are included.

Data for Forest Hills, Musquash, Lonewater Farm and Darling's Island from 1985-1989 is presented in Section 4.16. Data for the other Stations are also presented from 1988-1989.

The number of samples taken should be noted before drawing any conclusions regarding monthly or annual averages. These averages are calculated based on all samples taken with no minimum number specified.

Section 4.02

DARLING'S ISLAND

SUMMARY

PARAMETER		1989
Total Suspended Particulate	($\mu\text{g}/\text{m}^3$) *	10.7
Total Suspended Sulphate	($\mu\text{g}/\text{m}^3$) *	2.46
Total Precipitation	(mm)	1116.0
pH of Precipitation		4.35
Total Sulphate	(kg/ha/yr)	23.1
Excess Sulphate	(kg/ha/yr)	21.8
Total Nitrate	(kg/ha/yr)	16.7

SUSPENDED PARTICULATE
($\mu\text{g}/\text{m}^3$)

**** FREQUENCY DISTRIBUTION ****

MONTH	0-3	31-60	61-90	91-120	120+	NO. OF SAMPLES	MONTHLY AVERAGE
January	5	0	0	0	0	5	10.6
February	5	0	0	0	0	5	6.7
March	3	0	0	0	0	3	18.9
April	5	0	0	0	0	5	8.8
May	2	0	0	0	0	2	17.9
June	3	0	0	0	0	3	15.7
July	1	0	0	0	0	1	1.3
August	5	0	0	0	0	5	14.7
September	2	0	0	0	0	2	14.0
October	5	0	0	0	0	5	11.1
November	3	0	0	0	0	3	9.9
December	4	1	0	0	0	5	5.7
ANNUAL	43	1	0	0	0	44	10.7

Section 4.03

LONEWATER FARM

SUMMARY

PARAMETERS		1989
Total Suspended Particulate	($\mu\text{g}/\text{m}^3$) *	7.0
Total Suspended Sulphate	($\mu\text{g}/\text{m}^3$) *	1.85
Total Precipitation	(mm)	1134.0
pH of Precipitation		4.37
Total Sulphate	(kg/ha/yr)	21.5
Excess Sulphate	(kg/ha/yr)	20.0
Total Nitrate	(kg/ha/yr)	12.4

SUSPENDED PARTICULATE
($\mu\text{g}/\text{m}^3$)

**** FREQUENCY DISTRIBUTION ****

MONTH	0-30	31-60	61-90	91-120	120+	No. of Samples	Monthly Average
January	5	0	0	0	0	5	10.1
February	4	0	0	0	0	4	3.1
March	5	0	0	0	0	5	8.3
April	1	0	0	0	0	1	5.2
May	2	1	0	0	0	3	24.4
June	4	0	0	0	0	4	12.0
July	M	M	M	M	M	M	M
August	M	M	M	M	M	M	M
September	4	0	0	0	0	4	2.2
October	3	0	0	0	0	3	6.1
November	M	M	M	M	M	M	M
December	M	M	M	M	M	M	M
ANNUAL	28	1	0	0	0	29	7.0

Section 4.04

MUSQUASH

SUMMARY

PARAMETER	1989
Total Suspended Particulate ($\mu\text{g}/\text{m}^3$) *	12.6
Total Suspended Sulphate ($\mu\text{g}/\text{m}^3$) *	2.37
Total Precipitation (mm)	1473.3
pH of Precipitation	4.31
Total Sulphate (kg/ha/yr)	32.4
Excess Sulphate (kg/ha/yr)	28.6
Total Nitrate (kg/ha/yr)	20.9

SUSPENDED PARTICULATE
($\mu\text{g}/\text{m}^3$)

**** FREQUENCY DISTRIBUTION ****

MONTH	0-30	31-60	61-90	91-120	120+	NO. OF SAMPLES	MONTHLY AVERAGE
January	4	0	0	0	1	5	18.6
February	5	0	0	0	0	5	6.9
March	3	0	0	0	0	3	9.8
April	5	0	0	0	0	5	8.7
May	3	0	0	0	0	3	21.0
June	3	1	0	0	0	4	16.8
July	4	0	0	0	0	4	15.4
August	4	0	0	0	0	4	8.6
September	5	0	0	0	0	5	14.3
October	6	0	0	0	0	6	20.7
November	4	0	0	0	0	4	18.6
December	4	0	0	0	0	4	5.2
ANNUAL	50	1	0	0	0	52	12.6

Section 4.05

BONNY RIVER

SUMMARY

PARAMETER		1989
Total Precipitation	(mm)	1223.6
pH of Precipitation		4.17
Total Sulphate	(kg/ha/yr)	25.9
Excess Sulphate	(kg/ha/yr)	24.2
Total Nitrate	(kg/ha/yr)	18.4

Section 4.06

GOLDEN GROVE

SUMMARY

PARAMETER		1989
Total Precipitation	(mm)	1290.4
pH of Precipitation		4.28
Total Sulphate	(kg/ha/yr)	29.9
Excess Sulphate	(kg/ha/yr)	27.0
Total Nitrate	(kg/ha/yr)	19.3

Section 4.07

LAKEWOOD HEIGHTS

SUMMARY

PARAMETER		1989
Total Precipitation	(mm)	1217.1
pH of Precipitation		4.28
Total Sulphate	(kg/ha/yr)	26.8
Excess Sulphate	(kg/ha/yr)	24.5
Total Nitrate	(kg/ha/yr)	16.7

Section 4.08

MAGAGUADAVIC LAKE

SUMMARY

PARAMETER		1989
Total Precipitation	(mm)	993.9
pH of Precipitation		4.43
Total Sulphate	(kg/ha/yr)	19.5
Excess Sulphate	(kg/ha/yr)	18.8
Total Nitrate	(kg/ha/yr)	13.3

Section 4.09

PENNFIELD A

SUMMARY

PARAMETER		1989
Total Precipitation	(mm)	1329.4
pH of Precipitation		4.32
Total Sulphate	(kg/ha/yr)	28.5
Excess Sulphate	(kg/ha/yr)	25.2
Total Nitrate	(kg/ha/yr)	18.8

Section 4.10

PENNFIELD B

SUMMARY

PARAMETER		1989
Total Precipitation	(mm)	1000.4
pH of Precipitation		4.21
Total Sulphate	(kg/ha/yr)	22.0*
Excess Sulphate	(kg/ha/yr)	19.8*
Total Nitrate	(kg/ha/yr)	21.4*

Note: * data extrapolated from partial year records.

Section 4.11

SHANNON

SUMMARY

PARAMETER		1989
Total Precipitation	(mm)	1116.9
pH of Precipitation		4.33
Total Sulphate	(kg/ha/yr)	20.5
Excess Sulphate	(kg/ha/yr)	19.8
Total Nitrate	(kg/ha/yr)	13.3

Section 4.12

SOUTH OROMOCTO LAKE

SUMMARY

PARAMETER		1989
Total Precipitation	(mm)	1345.9
pH of Precipitation		4.31
Total Sulphate	(kg/ha/yr)	23.0
Excess Sulphate	(kg/ha/yr)	22.0
Total Nitrate	(kg/ha/yr)	17.1

Section 4.13

TRACY

SUMMARY

PARAMETER		1989
Total Precipitation	(mm)	1075.0
pH of Precipitation		4.29
Total Sulphate	(kg/ha/yr)	18.0
Excess Sulphate	(kg/ha/yr)	17.3
Total Nitrate	(kg/ha/yr)	14.1

Section 4.14

WIRRAL STATION

SUMMARY

PARAMETER		1989
Total Precipitation	(mm)	1101.1
pH of Precipitation		4.36
Total Sulphate	(kg/ha/yr)	18.0
Excess Sulphate	(kg/ha/yr)	17.3
Total Nitrate	(kg/ha/yr)	15.4

Section 4.15 CUMULATIVE RECORD OF ANNUAL PRECIPITATION DATA

Total Suspended Particulate/Sulphate ($\mu\text{g}/\text{m}^3$)

YEAR	DARLINGS ISLAND		FOREST HILLS		MUSQUASH		LONEWATER	
	TSP	SO ₄	TSP	SO ₄	TSP	SO ₄	TSP	SO ₄
1985	-	-	-	-	-	-	-	-
1986	17.7	2.22	-	-	14.9	2.20	19.1	2.02
1987	19.2	2.17	-	-	15.7	1.83	19.7	1.65
1988	22.8	2.40	-	-	18.4	1.80	16.9	1.50
1989	10.7	2.46	-	-	12.6	2.37	7.0	1.85

DARLING'S ISLAND

YEAR	PRECIP.	pH	Total SO ₄	EXCESS SO ₄	Total NO ₃
1985	1111.6	4.28	15.8	14.8	9.4
1986	1117.8	4.44	24.3	23.7	15.8
1987	997.5	4.65	15.2	14.3	7.5
1988	1092.8	4.01	16.0	14.8	11.6
1989	1116.0	4.35	23.1	21.8	16.7

LONEWATER FARM

YEAR	PRECIP.	pH	Total SO ₄	EXCESS SO ₄	Total NO ₃
1985	789.2	4.32	13.6	13.3	9.8
1986	1026.6	4.49	22.3	21.0	10.2
1987	1056.9	4.82	15.3	13.9	5.1
1988	1129.2	4.35	19.1	17.5	14.1
1989	1134.0	4.37	21.5	19.6	12.4

MUSQUASH

YEAR	PRECIP.	pH	Total SO ₄	EXCESS SO ₄	Total NO ₃
1985	1212.8	4.29	25.2	22.7	16.0
1986	1168.2	4.49	27.0	24.4	12.4
1987	1199.0	4.59	21.7	19.7	10.9
1988	1323.2	4.45	24.4	20.3	12.6
1989	1473.3	4.31	32.4	31.1	20.9

Note: * data extrapolated from partial year records.

FOREST HILLS

YEAR	PRECIP.	pH	Total SO ₄	EXCESS SO ₄	Total NO ₃
1985	1005.9	4.35	40.2	36.7	12.1
1986	--	4.48	35.3	31.2	13.6
1987	--	--	--	--	--
1988	--	--	--	--	--
1989	--	--	--	--	--

MAGAGUADAVIC LAKE

YEAR	PRECIP.	pH	Total SO ₄	EXCESS SO ₄	Total NO ₃
1988	792.1	4.42	12.9	12.3	8.6
1989	993.9	4.43	19.5	18.8	13.3

PENNFIELD A

YEAR	PRECIP.	pH	Total SO ₄	EXCESS SO ₄	Total NO ₃
1988	1010.8	4.37	17.5	15.2	12.4*
1989	1329.4	4.32	28.5	25.2	18.8

SOUTH OROMOCTO LAKE

YEAR	PRECIP.	pH	Total SO ₄	EXCESS SO ₄	Total NO ₃
1988	774.8	4.37	11.4	10.8	11.9*
1989	1345.9	4.31	23.0	21.8	17.1

SHANNON

YEAR	PRECIP.	pH	Total SO ₄	EXCESS SO ₄	Total NO ₃
1988	745.3	4.34	12.8	11.9	8.1*
1989	1116.9	4.33	20.5	19.8	13.3

Note: * data extrapolated from partial year records.

WIRRAL STATION

YEAR	PRECIP.	pH	Total SO ₄	EXCESS SO ₄	Total NO ₃
1988	731.2	4.35	11.1	10.7	7.7*
1989	1101.1	4.36	18.0	17.3	15.4

TRACY

YEAR	PRECIP.	pH	Total SO ₄	EXCESS SO ₄	Total NO ₃
1988	817.6	4.40	11.6	11.1	6.8*
1989	1075.0	4.29	18.0	17.3	14.1

BONNY RIVER

YEAR	PRECIP.	pH	Total SO ₄	EXCESS SO ₄	Total NO ₃
1988	891.7	4.24	17.0	15.8	9.4*
1989	1223.69	4.17	26.0	24.2	18.4

GOLDEN GROVE

YEAR	PRECIP.	pH	Total SO ₄	EXCESS SO ₄	Total NO ₃
1988	1032.9	4.43	14.9	13.5	9.0*
1989	1290.4	4.28	29.9	27.7	19.3

LAKEWOOD HEIGHTS

YEAR	PRECIP.	pH	Total SO ₄	EXCESS SO ₄	Total NO ₃
1988	45.5	4.42	0.9	0.7	14.1*
1989	1217.1	4.28	26.8	24.5	16.7

PENNFIELD B

YEAR	PRECIP.	pH	Total SO ₄	EXCESS SO ₄	Total NO ₃
1988	--	--	--	--	--
1989	1000.4	4.21	22.0	19.8	21.4*



PART 5 DISCUSSION OF RESULTS

The long term air quality objectives, as set out in Federal Guidelines and Provincial Regulations, are consistently being met in Saint John.

There were five exceedances during the year of the one hour sulphur dioxide standard as compared to three exceedances in 1988. One violation was recorded at Champlain Heights and the remaining four violations were recorded at Forest Hills. Annual averages were below the Provincial Standard of 60 $\mu\text{g}/\text{m}^3$ but showed increases at Champlain Heights, Forest Hills, Grand Bay and the Post Office, over previous years. The highest annual average was again recorded at Forest Hills.

The increase in sulphur dioxide concentrations can be at least partially attributed to higher capacity factors at the Coleson Cove and Courtenay Bay Thermal Generating Stations, and higher emission rates for the Irving Oil Refinery. Information from the Refinery indicated low sulphur crude were less abundant in the market place, increasing the sulphur content of industrial and heating fuels being supplied across the province.

There were no exceedances of the Provincial One Hour Standards for carbon monoxide or nitrogen dioxide. There were three exceedances of the Federal Ambient Air Quality Objectives (1-hour) for ozone at the Post Office Station in 1989, and no exceedances at the Forest Hills Station. This represents a significant decrease from the forty-two exceedances measured at the two full time monitoring stations in 1988.

The annual ozone average decreased at the Forest Hills Station and increased at the Post Office Station as compared to 1988. The annual average has been increased steadily at the Post Office Station from 1980 to 1989, while the annual average for the Forest Hills Station has shown variations with no set pattern. The highest annual average was recorded at the Post Office Station.

The major contributor to ozone concentrations appears to be long range transport from the Eastern Seaboard and the Great Lakes Region.

Two seasonal ozone monitoring stations were added to the network in 1989 at Norton and Fundy National Park (station operated by Environment Canada). These stations were operated as rural seasonal sites along with the Point Lepreau and Central Blissville Stations. There were five exceedances of the Federal Air Quality Objectives for ozone at the Fundy Park Station and no exceedances for the remaining three stations. This compares to forty-eight exceedances at the Lepreau and Central Blissville Stations in 1988. Because of the seasonal nature of these stations no other comparisons were attempted.

Annual averages for T.S.P. (total suspended particulate) at all locations were below the Provincial Twenty-four Hour Standard. There was one exceedance of the Provincial Twenty-Four Hour Standard recorded at the Regional Centre and no exceedances recorded at the other

three stations. This is a decrease from nine exceedances in 1988. there was a decrease in the annual average for T.S.P. for all four stations. The highest annual average was again recorded at the Regional Centre.

These four locations measured sulphate and lead in conjunction with T.S.P. The highest annual average for sulphate level was measured at the Forest Hill Station. The Regional Centre's annual average decreased while the annual average of the remaining stations increased. The highest annual average of lead was recorded at the Western District Police Station due to its close proximity to a major highway. Lead levels continued to drop with the continued decrease in the use of leaded gasoline.

Two PM-10 Hi Vols were added to the Saint John Air Quality Network in 1989 at Forest Hills and the Regional Centre. The highest values for particulate, sulphate and lead recorded by a PM-10 monitor in 1989 was recorded at the Regional Centre. The PM-10 values are lower than the regular Hi Vol values due to the smaller size selective inlet which measures particles less than 10 microns in size.

There were four hundred fifty-one (451) exceedances of the Provincial One-hour hydrogen sulphide standard as compared to seventy-five (75) exceedances in 1988. The annual average at the Regional Centre decreased from 1988. The decrease of the annual average is probably due to commissioning of the Noncondensable Gas Incinerator System (NCG) on the Digester Blow System at the Irving Pulp and Paper Ltd.

TSP was measured at three acid precipitation locations in the Saint John Region. There were no exceedances of the Provincial One-hour Standard for T.S.P. at these stations. The highest annual average of T.S.P. was recorded at the Musquash Station. The annual average T.S.P. has decreased for all three Stations since 1988.

Musquash recorded the greatest precipitation of the three Stations. These three wet deposition sites have been transferred to N.B. Power and the network was expanded to twelve sites for a two year study. The station that recorded the greatest amount of precipitation in the Expanded New Brunswick Precipitation Monitoring Network was South Oromocto Lake. The lowest pH was recorded at Bonny River and the highest sulphate level was recorded at Musquash. The annual average of precipitation for all the Stations increased from 1988.

PART 6 Guidelines, Abbreviations, Conversions and Glossary

REGULATIONS AND GUIDELINES ON GROUND LEVEL AIR QUALITY

New Brunswick Regulations

CONTAMINANT	1 hr	8 hr	24 hr	ANNUAL
Carbon Monoxide	35,000	15,000	-	-
Hydrogen Sulphide	15	-	5	-
Nitrogen Dioxide	400	-	200	100
Sulphur Dioxide	900	-	300	60
Total Suspended Particulate	-	-	120	70*

Federal Acceptable Guideline

CONTAMINANT	1 HR.	24 HR.	ANNUAL
Ozone	160	50	30

Regulations/Guidelines From Other Provinces (Ontario)

CONTAMINANT	1 HR.	24 HR.	ANNUAL
Dustfall	-	7 mg/m ²	4.6 mg/m ²
Lead	5	2	

NOTE: All values in micrograms per cubic meter unless otherwise stated. * Geometric Mean

ABBREVIATIONS

The following is a list of abbreviations and notations used in this report.

- pphm - parts per hundred million
- ppm - parts per million
- ug/m³ - micrograms per cubic meter
- M - data not available
- TSP - total suspended particulate
- NO₃ - Nitrate
- SO₄ - Sulphate

CONVERSION TO METRIC UNITS

The units of measurement used in the monthly reports were converted to metric units for presentation of annual averages. The conversion factors used were:

Sulphur Dioxide	SO ₂	1 ppm	= 26.5 ug/m ³
Carbon Monoxide	CO	1 ppm	= 1200 ug/m ³
Nitrogen Dioxide	NO ₂	1 ppm	= 19 ug/m ³
Ozone	O ₃	1 ppm	= 20 ug/m ³
Hydrogen Sulphide	H ₂ S	1 ppm	= 14ug/m ³
Nitrogen Oxide	NO	1 ppm	= 12 ug/m ³
Particulate	DUST	1 ton/mile ² /month	= 350.5 mg/m ² /month
Total Nitrate	NO ₃	Calculated from nitrogen wet deposition data via nitrogen/nitrate ratio (14/60).	
Excess Sulphate	ESO ₄	Sulphate deposition minus that calculated portion due to sea salt production.	

GLOSSARY

- 1) excess sulphate - a value corrected to remove the influence of sulphate from sea salt particles in the atmosphere.
- 2) geometric mean - the nth root of the product of n values
- provides a more accurate mean when extreme values (outliers) must be included in the data to be averaged.
- 3) PM-10 - a size selective Hi Volume Sampler which measures particulate in the atmosphere that is less than or equal to 10 microns in diameter.